THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte DENNIS GALLAGHER, RAMESHWAR BHARGAVA
and JACQUELINE RACZ

_____

Appeal No. 96-3684
Application 08/318,034[1]

_____

ON BRIEF

_____

Before WEIFFENBACH, PAK and WARREN, *Administrative Patent Judges*.

WEIFFENBACH, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 10-23. The remaining claims in the case, claims 1-9, have been withdrawn from consideration pursuant to a restriction requirement. We reverse.

[1] Application for patent filed October 4, 1994. According to appellants, the application is a continuation of Application 08/051,118 filed April 21, 1993, now abandoned.

The Claimed Subject Matter

The claims on appeal are directed to an encapsulated quantum sized doped semiconductor material. On page 4 of the brief, appellants state that "[c]laims 10-23 are patentable for similar reasons and stand together." We interpret this statement to mean that the claims on appeal stand or fall together. Accordingly, we will limit our consideration to claim 10, the broadest independent claim, which reads as follows:

> 10. A chemically doped precipitated particle of semiconductor material of less than 100Å in diameter encapsulated with a surfactant, the surfactant maintaining a quantum confinement of said particle and further providing a surface passivation of said particle, the dopant concentration of said particle being 0.05 - 1.0%.

References of Record

The following references of record are relied upon by the examiner as evidence of obviousness:

Enoki et al. (Enoki)	4,029,604	Jun. 14, 1977
Hilsum et al. (Hilsum)	4,137,481	Jan. 30, 1979
Herron et al. (Herron)	5,110,505	May 5, 1992

Weller et al. (Weller), "Photochemistry of Colloidal Metal Sulfides. 7. Absorption and Fluorescence of Extremely Small ZnS Particles (The World of the Neglected Dimensions)," *Ber. Bunsenges. Phys. Chem.*, Vol. 88, pp. 649-656 (1984).

Zhao et al. (Zhao), "Size Quantization in Semiconductor Particulate Films," *J. Phys. Chem.*, Vol. 95, pp. 3716-3723 (1991).

Encyclopedia of Polymer Science and Engineering (EPSE), Vol. 1, John Wiley & Sons, New York, pp. 229-231 (1992).

The Rejections

I. Claims 10-23 stand rejected under 35 U.S.C. § 103 as being unpatentable over Weller in view of Hilsum

II. Claims 10-23 stand rejected under 35 U.S.C. § 103 as being unpatentable over Hilsum in view of Zhao.

III. Claims 10-23 stand rejected under 35 U.S.C. § 103 as being unpatentable over Herron in view of Enoki and EPSE.

Opinion

After careful consideration of the respective positions advanced by appellants and the examiner, we cannot sustain the examiner's rejections.

Claim 10 is directed to a doped semiconductor particle having a diameter of less than 100 D "encapsulated with a surfactant." Before considering the rejections, we must first construe the meaning of the terms "encapsulated" and "surfactant." *Gechter v. Davidson*, 116 F.3d 1454, 1457, 43 USPQ2d 1030, 1032 (Fed. Cir. 1997). We give the terms of the appealed claims their ordinary meaning unless we find that another meaning is intended by appellants. *See In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). The ordinary meaning of "surfactant" is "[a]ny compound that affects (usually reduces)

surface tension when dissolved in water or water solutions, or which similarly affects interfacial tension between two liquids."[2] Since appellants' process for precipitating the doped semiconductor and adding the "surfactant" appears to be under anhydrous conditions (specification: pp. 7-8), appellants' use of the term "surfactant" does not meet the ordinary meaning of the term. However, appellants describe the use of their "surfactant" "[t]o maintain the separation for quantum confinement in precipitated particles ..." (specification: p.5). As for the term "encapsulated," appellants have not defined the term in their specification, but its ordinary meaning is to be "[e]nclosed by a protective coating."[3] Therefore, we construe claim 10 as defining a doped precipitated particle of semiconductor material that is enclosed by a "surfactant" which is any

coating material that will keep the semiconductor particle from agglomerating with other similar semiconductor particles.

REJECTION I

The examiner rejected claims 10-23 under 35 U.S.C. § 103 over Weller in view of Hilsum. Weller discloses forming a quantum sized (< 50 Å) ZnS colloid (experimental section, p. 630). According to Weller, each ZnS particle can be precipitated on a carrier. Weller specifically discloses a carrier comprising colloidal SiO_2 and that each carrier particle possesses one tiny ZnS particle (id.). Weller further

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[2] *The Condensed Chemical Dictionary*, 5th Edition, Ed. by Arthur and Elizabeth Rose, Rinehold Publishing Corporation, New York, p. 1055 (1956).

[3] *The American Heritage Dictionary*, 2nd College Edition, Houghton Mifflin Company, Boston, Mass., p. 451 (1982).

teaches and suggests that the ZnS may be doped with Mn to improve the fluorescence of the quantum particle. However, the examiner has not provided any technical and scientific reasoning for us to conclude that Weller would have taught or suggested to a person having ordinary skill in the art that ZnS particles are enclosed or encapsulated by SiO_2. Figure 17 on page 655 of Weller shows the ZnS particle being located on the surface of the SiO_2 particle, and not encapsulated by SiO_2 as required by the claims. Hilsum does not make up for the deficiency of Weller. The examiner acknowledges that Hilsum does not disclose or suggest ZnS particles having a diameter

less than 100 Å. Hilsum discloses an electroluminescent phosphor panel (EL) which includes a layer **5** having a thickness as small as 200 Å. The layer comprises ZnS doped with Mn (col. 3, lines 11-12). Hilsum does not disclose that the layer comprises particles of ZnS. Hilsum refers to the layer as a "monolayer" (col. 3, lines 14-15). While this "monolayer" may be mixed with a binder such as poly(methyl methacrylate) to improve its adherence to the film **3**, there is no teaching in Hilsum that layer **5** can be doped ZnS particles nor is there a suggestion in Hilsum to encapsulate ZnS particles with the poly(methyl methacrylate) binder. Thus, for the foregoing reasons, we reverse the rejection of the appealed claims over the combined teachings of Weller and Hilsum.

REJECTION II

The examiner rejected the appealed claims under 35 U.S.C. § 103 over Hilsum in view of Zhao. As discussed above, Hilsum discloses a layer of ZnS doped with Mn which can be mixed with a binder. The examiner acknowledges that Hilsum does not disclose or suggest quantum sized ZnS particles (i.e.,

particles having a diameter less than 100 D). The examiner relies on Zhao as disclosing the formation of quantum sized phosphor particles of ZnS and CdS. The examiner concludes that "[i]t would have been obvious for one of ordinary skill in the art to have used Zhao's 100 A [sic, D] or less ZnS particles in Hilsum" because "[o]ne of ordinary skill in the art would have been motivated to do this in order to create an EL device with characteristics different from bulk ZnS or to increase band gap energies." We do not find that the examiner has established a *prima facie* case of obviousness. The examiner has not explained why the increased band gap energies and why the need "to create an EL device with characteristics different from bulk ZnS" would have motivated one of ordinary skill in the art to use quantum sized particles in Hilsum's device. We find that the suggestion to use such phosphors could only have come from appellants' specification. "Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant*s disclosure." *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). Accordingly, we reverse Rejection II.

REJECTION III

The examiner rejected the claims on appeal under 35 U.S.C. § 103 over Herron, Enoki and EPSE. Herron discloses a porous glass with large (10-500 D) interconnected pores which are filled with a semiconductor material such as ZnS or CdS (col. 3, lines 4-44; col. 4, lines 4-8). The porous glass, as we have interpreted the claims, would serve as a "surfactant." Herron further discloses that

> [t]o protect the semiconductor clusters and maintain dispersion, the porosity of the glass is removed by filling all of the available remaining void volume with polymer. This can be done in an inert atmosphere by partially immersing the glass/semiconductor composite in

> methylmethacrylate (MMA) containing 1 wt. % VAZO-64® (Du Pont) to "wick" the monomer up to completely fill the pores of the glass. The impregnated glass is removed form the MMA/VAZO and heated in an inert atmosphere to about 60E C. for about 8 hours, leading to polymerization of the MMA to give PMMA throughout the glass pores.

The teachings of Herron would have reasonably suggested to a person having ordinary skill in the art that quantum sized semiconductor particles are encapsulated with a "surfactant," namely, glass and/or PMMA. However, Herron does not disclose or suggest an encapsulated doped semiconductor particle.

The examiner relies on Enoki as teaching doping ZnS with Mn and concludes that one of ordinary skill in the art would have been motivated to substitute Enoki's doped ZnS in Herron's ZnS particle in order to increase threshold voltage of the ZnS particle. Enoki discloses preparing a photoconductive powder by firing a mixture of CdSe, ZnS and ZnO, a Cu or Ag salt, a Cd or Zn chloride or bromide, and a Mn salt to form fine particles (abstract; col. 2, line 27 to col. 3, line 19). According to Enoki, "it is believed that ZnS and Mn salts diffused to the surface layer of CdSe particles act to raise the threshold voltage Vt, ZnO acts to decrease contact resitance [sic, resistance] among the photoconductive particles, and ZnS and ZnO act to suppress growth of photoconductive particles during the firing step and give fine particles" (col. 4, lines 59-65). The size of the fine particles is sufficient to pass thought 400 mesh which is about 37 Fm (about 37,000 D).

We cannot agree with the examiner's conclusion of obviousness. Enoki does not disclose or suggest quantum sized semiconductor particles nor does Herron teach or suggest that mixtures of

semiconductor materials can be employed to fill the voids in the porous glass. Moreover, Enoki does not disclose that ZnS is doped with Mn. It appears that ZnS and Mn salts diffuse into the surface layer of another semiconductor material in the resultant photoconductive particle, namely, CdSe. In addition, the examiner has not explained why increasing the threshold voltage would have suggested to or motivated a person having ordinary skill in the art to substitute Enoki's photoconductive particles for Herron's semiconductor.

We further considered the EPSE reference, but we do not find that this reference makes up for the deficiencies of either Herron or Enoki. Therefore, we find that the examiner has not established a *prima facie* case of obviousness of the claimed subjected matter over the combined teachings of Herron, Enoki and EPSE as suggested by the examiner. Accordingly, we reverse rejection the rejection of claims 10-23 under 35 U.S.C. § 103 over Herron, Enoki and EPSE.

Conclusion

For the foregoing reasons, the examiner's rejections of claims 10-23 under 35 U.S.C. § 103 are reversed.

REVERSED

CAMERON WEIFFENBACH)
Administrative Patent Judge)
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	) BOARD OF PATENT
CHUNG K. PAK	)
Administrative Patent Judge	) APPEALS AND
	)
	) INTERFERENCES
	)
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